a.) Amendments to Specification

Replace the paragraph beginning at page 1, paragraph [03], in the specification as originally filed, with the following rewritten paragraph:

--The Achromatic Fresnel Optic (AFO) is a multi, such as two, element compound optic that is comprised of a diffractive Fresnel zone plate and a one or more refractive Fresnel lenses. The optic is described in U.S. Patent Application Serial Number 10/134,026 (U.S. Pat. Appl. Publ. No. US 2005/0168820 A1), which is incorporated herein by this reference in its entirety. Further uses for the optic are described in U.S. Patent Application Number [[____]] 10/683,872 filed on October 10, 2003, by Wenbing Yun and Yuxin Wang (U.S. Pat. Appl. Publ. No. US 2004/0165165 A1), which is incorporated herein by this reference in its entirety.--

Replace the paragraph beginning at page 2, paragraph [07], in the specification as originally filed, with the following rewritten paragraph:

--Techniques for fabricating the refractive element generally include: 1) ultra-high precision mechanical machining, *e.g*,. diamond turning; 2) lithographic techniques including[[.]] gray-scale lithography and multi-step lithographic processes; 3) high-energy beam machining, such as electron-beam, focused ion beam, laser, and plasma-beam machining; and 4) photo-induced chemical etching techniques. Also addressed are methods of aligning the two optical elements during fabrication and methods of maintaining the alignment during subsequent operation.--

Replace the paragraph beginning at page 3, paragraph [14], in the specification as originally filed, with the following rewritten paragraph:

--Fig. 1 is a side plan, cross sectional view of ~~an~~ a compound optic or AFO;--

Replace the paragraph beginning at page 4, paragraph [22], in the specification as originally filed, with the following rewritten paragraph:

--Fig. 9 is a schematic plan view of a free standing zone plate lens element according ~~ot~~ to the invention.--

Replace the paragraph beginning at page 4, paragraph [26], in the specification as originally filed, with the following rewritten paragraph:

--In the example in which the compound optic 1 is an ~~AFO. It~~ AFO, it includes a primary focusing element, which is the diffractive Fresnel zone plate 5, and chromatic dispersion compensating elements which is the refractive lenses 6. The refractive lens 6 compensates for the chromatic dispersion of the zone plate 5 but with no or very small focusing effect.—

Replace the paragraph beginning at page 5, paragraph [31], in the specification as originally filed, with the following rewritten paragraph:

--Specifically, Fig. 2A shows a sharp single-crystal diamond tool tip 10 of a diamond turning machine. The diamond tool tip 10 is controlled by a precision positioning system 11 and is driven along the surface 114 of the substrate 8. In one example, the substrate is silicon wafer material or copper. The tool 10 ~~remove there~~ removes the material of the substrate 8 typically while the substrate is turned or rotated around a center axis 116 to thereby perform the cut.--

Replace the paragraph beginning at page 5, paragraph [32], in the specification as originally filed, with the following rewritten paragraph:

--As ~~shows~~ shown in Fig. 2B, once the surface profile 110, 112 is machined, the substrate 8 is typically thinned from the backside by removing the material in region 12 to thereby form an optical port to increase the transmission, if necessary. Finally, the second optical element, such as a diffractive zone plate element is then formed in the optical port 12, in one example.--

Replace the paragraph beginning at page 5, paragraph [37], in the specification as originally filed, with the following rewritten paragraph:

--As shown in Fig. 3A, the substrate 8 is first coated with a layer of photoresist 14. Then, the photoresist 14 is exposed with a spatially varying dosage (see dosage exposure profile 18) that corresponds <u>to</u> the inverse of the desired surface profile.--

Replace the paragraph beginning at page 6, paragraph [42], in the specification as originally filed, with the following rewritten paragraph:

--Finally, the ~~refractive~~ <u>diffractive</u> element 5 formed on the backside of the substrate 8.--

Replace the paragraph beginning at page 6, paragraph [45], in the specification as originally filed, with the following rewritten paragraph:

--This is fabricated according to the following process as shown in Fig. 4B. A substrate 8 is first coated with a first layer of silicon 20 and then a layer of photoresist 22. An etch stop layer is typically located between the silicon layer 20 and the substrate 8. The photoresist 22 is exposed with a pattern (see exposure dosage profile 24) that corresponds to the lowest level of the staircase. After the resist 22 is developed, the first silicon layer 20 is etched to yield the lowest part of the staircase. The lens/substrate is then coated with, possibly, a thin etch stop layer and then resist 25 and polished to produce a flat surface, and then coated with another layer of silicon 26. Another layer of photoresist 28 is coated over this silicon layer 26 and exposed with a pattern that corresponds to the next level of the staircase (see exposure dosage profile 30). A two-level staircase pattern will be produced after the resisted is developed and the silicon layer is etched (see reference numeral 60). This process is repeated until the ~~desire~~ <u>desired</u> staircase profile is obtained (see reference 62). The result pattern is encased in photoresist, and removing the photoresist will produce the refractive lens (see reference 64). The substrate 8 can be thinned or removed to reduce absorption.--

Replace the paragraph beginning at page 7, paragraph [46], in the specification as originally filed, with the following rewritten paragraph:

--Finally, the ~~refractive~~ diffractive element 5 is formed on the backside of the substrate 8.--

Replace the paragraph beginning at page 7, paragraph [50], in the specification as originally filed, with the following rewritten paragraph:

--This method is analogous to the diamond-turning machine in that the lens profile is produced directly on the substrate 8 in a 1-step process, except that energetic particles are used instead of a solid tool tip. This method can achieve about 1 micrometer accuracy with lasers and better than 10 nm accuracy with a focused ion beam. The substrate 8 of the finished lens can be thinned from the back to reduce absorption, and the ~~refractive~~ diffractive element 5 formed on the backside.--

Replace the paragraph beginning at page8 , paragraph [56], in the specification as originally filed, with the following rewritten paragraph:

--Referring to Fig. 6A, the silicon substrate 8 is placed in a chlorine gas environment 118. A high-power laser spot 50 is then focused onto the surface of the silicon wafer 8 causing the surface to locally heat up and melt into a molten state. This causes the reaction rate with chlorine to increase twenty fold, and the molten zone is etched away at a much higher rate than the unheated region to yield the desired profile 110, 112 as shown in Fig. 6B. This method is capable of producing features with up to 1 micrometer ~~um~~ (μm) accuracy in the transverse direction and 10 nm in the longitudinal direction.—

b.) Amendments to Abstract

Replace the paragraph beginning at page 15, paragraph [76], in the specification as originally filed, with the following rewritten paragraph:

--Methods for fabricating refractive element(s) and aligning the elements in a compound optic, typically to a zone plate element ~~are disclosed~~. The techniques are used for fabricating micro refractive, such as Fresnel, optics and compound optics ~~comprising~~ <u>including</u> two or more optical elements for short wavelength radiation. One application is the fabrication of the Achromatic Fresnel Optic (AFO). Techniques for fabricating the refractive element generally include: 1) ultra-high precision mechanical machining, *e.g*,. diamond turning; 2) lithographic techniques including[[.]] gray-scale lithography and multi-step lithographic processes; 3) high-energy beam machining, such as electron-beam, focused ion beam, laser, and plasma-beam machining; and 4) photo-induced chemical etching techniques. Also addressed are methods of aligning the two optical elements during fabrication and methods of maintaining the alignment during subsequent operation.--